DOCUMENT RESUME

ED 196 576 RC 011 360

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TITLE Colorado Outward Bound School River Rafters' Manual.
INSTITUTION Colorado Outward Bound School, Denver.
PUB DATE Mar 72
NOTE 37p.: Paper copy not available due to publisher's preference.

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Adventure Education: Camping: Equipment Maintenance: Equipment Utilization: *Experiential Learning: Field Instruction: Food: Outdoor Education: Program Design: Recreational Activities: *Safety: *Teacher Responsibility
IDENTIFIERS *River Rafting

ABSTRACT

Instructional sequences, safety rules, duties of crew members, and procedures for Colorado Outward Bound School river rafting trips are summarized in this manual. Designed to acquaint instructors with the duties expected of them on the trips, the information in the manual is presented in outline form and is interded for those with prior river experience. It covers all the sequences of a river trip, beginning with the necessary pre-trip preparations. The section on roles of the river staff itemizes the duties of each staff and crew member. Food organization, sanitation and cleanup, and camp craft are also explored. The instructional sequence covers proper dress, safety rules, crew responsibilities, command signals, basic strokes, and rapids procedures. Direction on raft care include inflation and preparation, daily care, cleaning, drying, and deflating at the end of the trip. Use, equipment, rigging and position of the support pontoon boat are outlined along with the duties of its boatmen. Emergency procedures include those for man overboard, raft tipover, injury, illness, or death. Appendices list the basic needs in clothing, dunnage bags, first aid supplies, group equipment, and boating equipment. Four days of menu ideas are also given. A section on Dinosaur National Monument includes information on its geology, prehistory, early exploration, and modern developments. (DS)

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Introduction

This river Manual is designed to help rafting instructors understand what is expected of them when they work on a Colorado Outward Bound river trip. While there is some handy information included which may be an aid in teaching in the field, this Manual should be studied well in advance of the river trip. All areas that are not well understood by the potential rafting Instructor should be studied and all suggested reading materials (found in Appendix D under resource box material) should be read.

While writing this Manual, I have worked under the assumption that it is written for those persons with prior river experience, although aspiring potential rafting Instructors may gleen some helpful information from it.

Reading this document alone is NOT sufficient to qualify a person to run a river. There is no substitute for actual river experience. River running is a dangerous activity and must not be done without a competent, experienced and mature person in charge of the entire party and a qualified person in charge of every boat.

I wish to extend my thanks to the many persons who helped me in preparing this Manual.

Mark Leachman

Colorado OUTWARD BOUND School

River Specialist

March 1972

Entire Manuel Printed on Recycled Stock

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I. Pre Trip Preparations - Procedure before leaving logistics base camp

A. Permit:-Be sure you have a permit to run the river if required (including campsite reservations).
B. Clothing list:- Should have been sent to participants prior to trip.
C. Dunnage bags: -Be sure you have an adequate number plus spare items
D. Boating equipment: - Be sure all is loaded, inspected-check on master list
E. Food: - Make sure all is packed for proper number
F. Shuttle drivers: - If needed make arrangements
G. Rescue facilities and Escape routes: - Check to see if staff is breifed on facilities, routes and procedures
H. Coordinator: - Phone trip Coordinator to check last minute changes

II. River Trip Coordination - Procedure of office or School Coordinator (applicable to COBS but not necessarily to other groups)

A. Recruiting - Coordinator should cover recruiting participants
B. Transportation: - Coordinator should arrange transportation to the river , may ask river staff to help ie. to hire a bus from river end.
C. Coordination: - Coordinator should inform River Specialist of final number of participants, shuttle drivers needed, etc.
D. List of Participants:- Coordinator should give a list of names of participants to River Specialist prior to trip in order to purchase food
E. Boat Crews: - Make tentative boat crew assignments
F. Cook Crews: - Make tentative cook crew assignments

III. Roles of River Staff

A. River Specialist: Is the final authority on the river, His duties are

1. Safety - On and off the river to include:

   a. Checking safety of gear (life jackets esp.)
   b. Safety while running rapids
   c. Swimming sites
   d. Safety lecture
   e. Appoint lead & sweep boat

2. Expedition Planning - With staff

   a. Camp sites
   b. Rivers
   c. Negotiations with authorities (not park service etc.)

3. Approval of staff qualifications
4. Delegation of responsibility to staff
5. Coordination with logistics
6. Oversee total trip
7. Working with own raft as rafting instructor
8. Procurring a permit to run the river

B. Assistant River Specialist: Second in command of trip, Duties of a rafting instructor but will take over command if river specialist is incapacitated or absent. Often in sweep boat for safety

C. Rafting Instructor: Basically in charge of his boat

1. Safety: On and off River
2. Teaching river technique & theory to students
3. Camping procedure with crew. Include cooking
4. Equipment: Management and care
5. Responsible for students on and off River
6. Coordinate group dynamics & discussions

7. Geology: Should be able to point out and explain the following geologic features: Anticlines, synclines, faults, geological time eras, when & where fossils are found, types of rocks, (See Appendix G)
8. History: Be able to give a brief History of the area - See resource material in Appendix D part J.
   Also read the appropriate chapters in:
   A Canyon Voyage F. S. Dellanbagh
   The Exploration of the Colo. & Its Canyons J. W. Powell
   Beyond The 100th Maridian W. E. Stegner

D. Logistics Coordinator: Duties include with Assistant

1. Maintaining warehouse & equipment
2. Maintaining vehicles
3. Supervising and checking pre trip equipment loading
4. Food planning, purchasing & packing
5. Dunnage bag preparation, issue & return
6. Contacting shuttle drivers
7. Inventory of equipment
8. Purchasing new equipment
9. Visual check of all equipment prior to each trip

IV. Check in and Equipment Issue: Procedure at put in point of trip

A. Boat & Cook Crews: Divide group into Boat crews and meet with rafting instructor
B. Equipment Issue: Rafting instructor will explain the use and care of all equipment to his/her crew
C. Cups: Cups should be kept with the participant during the day

D. Clothing Check: Rafting instructor should insure that all participants have adequate clothing to meet expected weather conditions

E. Dunnage Bags: Rafting instructor shall explain the use and care of dunnage bags, and proper sealing for water tightness

F. Shelter: The rafting instructor shall explain or demonstrate how to rig a rain shelter

G. Introduction of staff: At some point before retiring for the night an introduction of the OUTWARD BOUND Staff should be made

H. Participants Expectations: At some point during the first evening a discussion of the participants expectations should take place. If time is limited, do this on day two.

I. Explain the need of speed in getting off in the morning

J. Explain latrine procedure to group

1. Use outhouses when available
2. Use Porta-Pottie when no outhouses are near
3. When bushing it, burn toilet paper and bury excrement, designate one location

V. Camp Craft

A. Cooking: Each rafting instructor should cover the following with his cook crew

1. Use and care of coleman stove
2. Explain food organization in food bags
3. Explain the use of utensil box
4. Explain the menus for that meal - get from River Specialist
5. Explain the importance of drinking plenty of liquids
6. Explain the importance of using drinking water vs. River water for various tasks
7. Use a fire pit if available
8. Explain the need for a cooking table and serving table
9. Insure that all food and utensils are put away at night

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B. Sanitation and Clean up:

1. Explain the need and use of boiled river water for wash and clorox rinse buckets
2. The cook crew shall be responsible for cleaning and storing eating & cooking utensils (cups excluded)

    a. Use a hot wash and rinse
    b. Let dry
    c. Pack in communal dish or utensil box

3. Explain the care of dutch ovens and griddles

    a. Do not use detergents for cleaning
    b. Do not let item get too hot
    c. Do not let item rust

4. Explain how cups can spread disease
5. Explain that the outhouses or porta-potties shall be used
6. Explain that all trash shall be taken with the party

C. Food Organization:

1. Be sure all food is in the proper bag and bag is labled (logistics staff lables)
2. In packing try to minimize the chance of glass breakage
3. Be sure that bag is sealed properly
4. Insure that a lunch bag is prepared every morning

    a. Old trash should be removed
    b. Contents of the bag should be checked and restocked

5. Insure that the bread & egg boxes are placed where they will not be crushed
6. Insure that all trash is bagged and put in empty food box

VI. Raft inflation and Preparation: The following should be done by the Rafting Instructor

A. Check with Logistics Coordinator for any new details on the equipment
B. Unloading: Vehicles should be unloaded by the participants
C. Inflation: Demonstrate how to inflate boat and check pressure
D. Accessories: Have participants get the proper number of paddles, life jackets, resource boxes, camera boxes, repair boxes, first aid boxes, bailing buckets, pumps, burlap bags, tie in ropes, water jugs, food bags, and dunnage bags
E. Launch Boat: Show how to carry boat - do not drag
F. Load Boat: Show how to

1. Tie in dunnage bags to stay out of water
2. Tie in food bags
3. Keep ropes short to ammo boxes
4. Secure bow line - slip knot on bow
5. Have no loose lines on board
6. Keep bow light
7. Leave leg room
8. Sit on tube
9. Tie in spare paddles & life jackets

G. Use of Equipment: Demonstrate or explain use of all equipment
H. Care of Equipment: Demonstrate or explain care of all equipment. Especially how to keep ware through chafing or rubbing to a minimum.
I. Knots: Demonstrate the following knots for tieing in

1. Half hitch
2. Bowline
3. Clove hitch

J. Life Jackets: Stress care of Life Jackets

1. Do not sit on Life Jackets
2. Spares carried on top of duffle
3. Squeeze bag to check for leaks

VII. Safety:

A. Safety Policy: - Policy of the OUTWARD BOUND School

1. The River Specialist shall review saf rules with participants just prior to each trip
2. The river specialist shall establish a serious tone at the onset of each trip and set an example of safety
3. The river specialist shall check all life jackets prior to each trip and reject damaged ones
4. The river specialist shall assign a lead boat and sweep boat prior to each trip

    a. Lead boat shall not be passed
    b. Sweep boat shall have sweep box which contains

        1. First Aid Box
        2. Repair Kit
        3. Pump
        4. 150' of 7/16" rope

5. Rafting Instructors shall be approved by River Specialist.
6. A pick up boat shall be stationed below each major rapid
7. River Specialist may require each participant to float in life jacket to realize power of river
8. All new rivers shall be reconnaissanced before taking clients on trip
9. Each boat shall be manned by a competant instructor, be in a position to take over command of boat in event of any emergency
10. Pontoon raft with safety equipment shall be on all trips where an escape route is more than 24 hours downstream

B. Safety Rules: To be explained by River Specialist prior to each trip

1. Life Jackets shall be worn while on, in, or near the river
2. Tennis shoes shall be worn while on or in the river
3. No swimming in the river without life jacket and approval of River Specialist. No diving into the river
4. Rafting instructors are responsible for keeping the raft immediately following in sight at all times
5. Review procedure for "Man Overboard": Swimmer floats on back, feet down stream, back stroking gently to retain stability
6. Exposure or Hyperthermia shall be explained briefly and emphasis on quick rescue given. Warning about expending energy in the water shall be given
7. No loose lines on board. Explain how to tie up bowline

VIII. Instructional Sequence

A. Instruction given by River Specialist prior to embarking on river:

1. Dress: Explain the follow

a. Wool is warm even when wet
b. Wind proofing is necessary
c. Sun protection to include sun glasses hat and Zinc Oxide

2. Crew Responsibilities: Explain the following

a. Rafting Instructor - ultimate commander
b. Captain - Shouts commands
c. Signalman - gives paddle signals
d. Bowman - Last one in, first one out, bow rope stower

3. Basic Commands: Commands given by Captain. Stress that they should be standard.
   Left, Right, Forward, Back paddle, Hold, Rest
4. Signals: Explain usage

   a. Man Overboard - One paddle in air
   b. Stop (lead boat)- one paddle swirled in air and pointed horizontally with blade toward desired bank
   c. Emergency Stop (any other boat)- All paddles breifly in air accompanied with shouts
   d. Danger Ahead - Two paddles crossed and then pointed in the direction to go to avoid danger

5. Basic Strokes: Explain the following

   a. Forward stroke
   b. Backward stroke
   c. Procedure for left turn
   d. Procedure for right turn
   e. Draw stroke

B. Instructional Sequence: Given by Rafting Instructor while on River

1. Commands and turns - Practice turns and paddling
2. Anticipating boats momentum in turn- pick out a reference point on bank
3. Captains: Rotate captains in flat water so everyone has turn
4. Ferry Position: Explain how to get 45° to current
5. Float in Life Jacket: Have crew float in life jacket, two at a time. Note swimming ability and composure.

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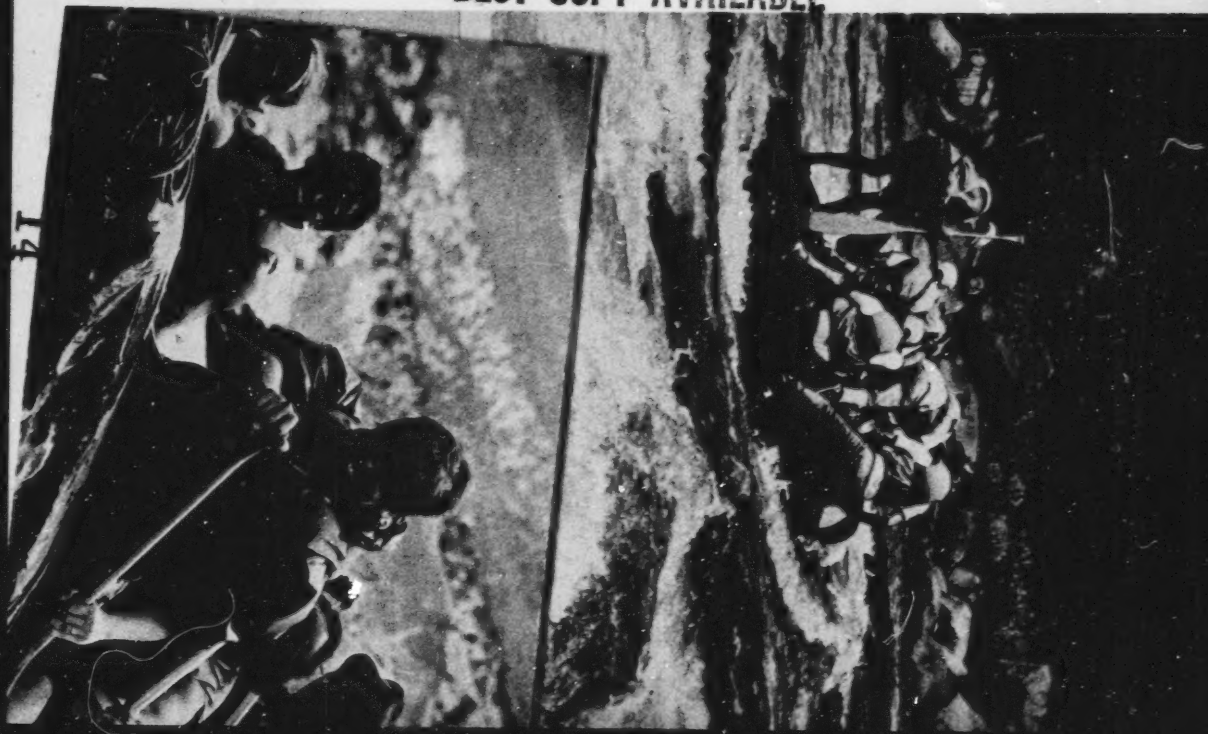

Have students discover:

a. Coldness and power of river
b. Difficulty of getting back in raft

C. Instruction by River Specialist at first minor rapid

1. Eddies & eddie fences
2. Tongue
3. Holes
4. Sleepers — Review & theory
5. Angle of entry
6. Position — Questions answered

D. Instruction at major Rapids by rafting Instructors: Have students work as a group to:

1. Identify the obstacles and potential current problems
2. Consider the ideas of each crew member
3. Make a plan and alternate plan
4. Decide how to initiate alternate plan if necessary
5. Pick out markers on shore to help identify position in rapids
6. Check with River Specialist if the run is out of the ordinary or dangerous
7. Designate captain, bowman and signal man

IX. Daily Care of Boat: Duty of rafting instructor each evening

A. Unload boat
B. Turn boat on side and wash out all sand and trash
C. Check for holes or leaks in floor and tubes
D. Turn raft over and carry above high water mark

E. Tie the boat to rock or tree so it won't blow away
F. Bunch all life jackets and place on top of boat- secure
G. Put all raft gear neatly near boat

X. Ending The Trip: Procedure under direction of Logistics Coordinator

A. Unloading Boats: Gear should be in separate piles to get accurate count
B. Raft Care: Includes

1. Washing - to remove sand and trash
2. Drying - In the sun to prevent rot
3. Deflate

C. Loading Rafts - Rafts should be well tied and loaded in bottom of trucks or trailers
D. Dunnage bags:

1. Gear in separate piles for accurate count
2. Gear should be dry
3. Packed into bags - Sleeping bags in one bag, cups in another etc.

E. Food Bags:

1. Trash into garbage can
2. All bags washed out
3. Reuseable items in one or two bags to be recycled

F. Loading: Load items that must be worked on near top of load
G. Permit: Notify authorities of end of trip if necessary
H. Billing: Inform office of numbers involved and extra expenses

I. Salvage all irrepairable equipment
J. All equipment should be visually checked by Logistics Coordinator

XI. Support Pontoon Boat:

A. Use:

1. Safety:

a. Litter evacuations
b. More stability in rough water
c. Speed with motor
d. More safety equipment

2. Extra cargo capacity
3. Towing with motor

B. Equipment on Boat:

1. Litter
2. Large First Aid Box - Includes: (Also see Appendix D - M)

a. Splints
b. 2 large electric lamps

C. Rigging: The advantage is that one man can run the boat

1. Rowing frame with oars
2. Motor mount for outboard
3. Two spare oars

D. Position:

1. Stays very near other boats
2. Runs major rapids first
3. Acts as safety boat below rapids

E. Duties of pontoon boatman

1. Supervise loading & unloading of pontoon
2. Keeps an eye on workload of other staff and help out as needed. Possibly help river specialist in supervising his crew while River Specialist checks safety equipment

XII. Emergency Procedure: While the procedure in an emergency depends on many factors (including location, weather, time, water level, etc.) and no hard and fast rules can be documented, some general guidelines are:

A. Man Overboard:

1. Get victim out of water as soon as possible
2. Expect to treat victim for hyperthermia
   a. Build a fire
   b. Put in sleeping bag (if warrented)
   c. Apply external heat if needed, warm between 2 bodies
   d. Change wet clothes
   e. If conscious drink hot liquids, tea, soup
3. Report incident to head River Specialist
4. If victim was in river for a long time, report incident to safety chairman at main office

B. Raft Tipover:

1. Go for the people first
2. Expect to treat victims for hyperthermia - See above
3. Tow boat or put crew on over-turned boat and proceed to shore

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4. Assign one boat (or two if available) to pick up stray flotsam
5. Right raft, reinstate crew when recovered, and proceed
6. Written report of incident to head River Specialist and safety chairman at main office

C. Injury or Illness:

1. Give proper first aid

2. Evacuate to nearest appropriate escape route
3. Transport to nearest hospital facility (via ambulance if warranted)
4. Notify head river specialist, Head Office, and proper authorities (ie. Park Service) immediately
5. Fill out accident report and send to Head Office

D. Death:

1. Attempt to revive victim via first aid methods
2. Body not found:

   a. Mark last seen spot
   b. Check in eddies and heads of islands for body

3. Body found:

   a. Wrap body carefully to prevent further injury or disfigurement to body
   b. Evacuate to nearest appropriate take out point
   c. Evacuate to nearest hospital

4. Report to Head River Specialist, Main Office, local authorities, including Park Service (if applicable) and police
5. Fill out all needed reports
6. Do not make any public statements until authorized to do so by School Director
7. Have local authorities or Main Office Notify next of kin

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Appendix A

1. Clothing List To be sent to each participant prior to trip

Required

Summer:

Long sleeve cotton shirt
Warm wool sweater
Wide brimmed hat
Sunglasses
Belt
Bathing suit or shorts
Tennis shoes
Walking shoes (extra tennis shoes or boots)
Long pants 2 pair
Minimum personal hygene
Plastic bags (for film, soap, etc.)
Knife, pocket
Bandana
Socks, 2 pair
Underwear
1/2 Towel
Sun tan lotion
Insect repellent
Flashlight

Early Spring or late fall: Add to above

Wool long pants (reject one pair of Summer pants)
Wool socks - 2 pair
Long sleeved wool shirt
Long underwear
Wool cap
Warm wool sweater - important
Light wool gloves

Optional:

Work gloves lightweight
Camera & film
Notebook

2. Dunnage Bags

The following equipment is in each Dunnage bag supplied by C.O.B.S.: (2 people 1 bag)

1 Dunnage bag
1 Dunnage bag liner with closer (or two plastic liners)
2 Sleeping bag liners
2 Sleeping bags
2 Stuff sacks
2 Foam pads (or1/4 ensolite)
2 Ground sheets
2 Rain jackets
2 Rain pants
2 Cups
2 Knife, fork, & spoon sets (or 2 spoons)
2 Canteens
2 Water proof matchboxes

3. Group Equipment

I. Cooking gear:

A. Dutch oven (S)
B. Griddle (S)
C. Cooking Utensils

1. Can opener
2. Spoons
3. Spatulas
4. Meat forks
5. Tongs
6. 10 qt bucket (2)
7. Bowls
8. Scrubber or brush
9. Pots

D. Eating utensils, plates, bowls , knife, fork, spoons in Group Utensil box.
E. Gunny Sacks or trash bags
F. Coleman Stoves
G. Shovel
H. Food bags

II. Camping Gear:

A. Rain flys
B. Flashlights
C. Water jugs (2 per boat)
D. Coleman lantern W/Gas
E. Parachute Cord
F. Coolers

III. Sanitation Gear:

A. Buckets
B. Soap
C. Scrub brushes
D. Clorox
E. Dish towels

4. Boating Equipment

A. Rafts
B. Life Jackets - 1 per person + 20% extra one spare per boat
C. Paddles - 1 per person + 2 spare per boat
D. Tie in ropes - 4 per boat
E. Camera Boxes - 2 per boat
F. Pumps - 2 per trip
G. Bail buckets - 2 per boat
H. First Aid Box - 2 per trip to include:

20 3/4" Bandaids
1 Tube First Aid Ointment
1 Tube Vaseline or Foille
2 Tube Zinc Oxide
1 Bar soap and box
1 8 x 12 roll of Moleskin
1 Roll 2" gauze (360" long)
4 4 x 4 Gauze pads
6 2 x 2 Gauze pads
4 Sterile Telfa Pads
?(1 3" Ace Bandages)

1 Roll 2" Adhesive tape
1 Roll 1" Adhesive tape
2 Vials Aspirin Tablets
1 Vial Cold Tablets
1 Vial Placebo
2 Vials Salt Tablets
1 Vial Halazone Tablets
1 Pair Sissors
1 Tweezers
1 Nail Clipper
6 Safety pins
1 Thermometer
6 Accident Reports
1 First Aid Booklet
2 Golf Pencils

I. Patch Kit - 2 per trip to include:

Glue	Pliers
Solvent	Screwdriver
Patch material	Sissors
Wire brush	OB Knife
Nylon thread	Needles

J. Sweep Box - one per trip Includes:

Black bag	First Aid Box
Pump	Patch Kit
150' of 7/16" rope	

K. Parachute Cord - One roll available
L. Resource Box - One per Raft, should include the following:

Use appropriate educational material depending on the area, for Dinosaur National Monument use:

1. River Runners Guide to the Green & Colorado Rivers (from Flaming Gorge Dam) Philip Hays & Elmer Santos
2. A Popular Guide to the Geology of Dinasour Nat. Monument, Unterman
3. The Dinosaur Quarry, Good, White & Stucker
4. The Geologic Story of the Uinta Mountains, Hansen
5. John Wesley Powell, Soldier, Explorer Scientist. (Pamphlet)
6. Topographic Map of Dinosaur National Monument
7. Geologic Map of Dinosaur National Monument

M. Support Raft - 22' pontoon

1. Rowing frame
2. Floor Boards
3. Oars - 4 per trip
4. Stokes Litter
5. First Aid Resupply Box - one per trip to include:

SUGGESTED FIRST AID RESUPPLY BOX

100 Bandaids
1 Large roll of Moleskin
9 Tubes First Aid Ointment
9 Tubes Vaseline or Foille
14 Tubes Zinc Oxide
4 Triangular bandages
3 Bars of soap w/dish
2 First aid booklets
6 Rolls 1" adhesive tape
6 Rolls 2" adhesive tape
6 Rolls 2" Gauze
24 4 x 4 Gauze pads
24 Telfa Pads
24 2 x 2 Gauze Pads
4 3" Ace Bandages
2 Large electric lanterns
2 Leg splints

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Boating Equipment Cont'd

100	Aspirin
100	Cold Tablets
1,000	Salt Tablets
1,000	Halazone
100	Placebos Tablets
1	Pr Sissors w/6" blade
3	Pr Sissors w/3" blade
3	Tweezers
3	Nail Clippers
36	Safety pins
36	Golf Pencils
36	Accident Reports
3	First Aid Manuals
3	Oral Thermometers
12	Empty plastic vials
2	Arm splints

6. Boat tarp
7. Tie down rope

5. Suggested 4 Day Menus

Dinner #1, Pork Chops

Soup: Boxes Soup, Box crackers, Saltine
Pork Chops: Pork Chops (2/person),Cans applesauce, Boxes Rice
Salad: Heads lettuce, Tomatoes, Cucumber, Bottles salad dressing
Dessert: Apple turnovers, fresh (or equivalent)
Beverage: Cases Beer or Gallons Milk or Pkg. Wylers, Coffee, Tea
Misc: Sugar, Salt, Pepper, Paper Towels

Dinner #2, Steak

Soup: Box soup, Box Crackers
Salad: Heads Lettuce, Tomatoes, Cucumbers, Bottles salad dressing
Steak: Steaks, Potatoes (fresh, to bake) Steak sauce, sour cream & butter, Aluminum foil
Dessert: Watermellons
Beverage: Beer or Wylers, Coffee, Tea
Misc. Sugar, Salt, Pepper, Paper Towels

Dinner #3, Chicken

Soup: Boxes Soup, Boxes crackers
Salad: Heads Lettuce, Tomatoes, Cucumbers, Salad Dressing
Chicken: (Cook in dutch oven), Chickens (1/3 chicken/person), Btls Barbeque sauce, bags almonds, Boxes wild Rice
Dessert: Boxes vanilla pudding, Cans condensed milk, Cans Blackberries, Bags Cookies
Beverage: Coffee, Tea, (Beer)

Dinner #4, Ham

Soup: Boxes Soup, Green Pea, Boxes Crackers
Ham: Can Ham 6 lbs, Can Pineapple Rings, Brown Sugar
Yams: (Baked in Foil, Fresh Yams (or Sweet Potatoes) , Margarine
Cornbread: Boxes Cornbread, Honey
Dessert/Salad: Cans Fruit Cocktail, Can Mandarin Oranges, Can Grapefruit Sections, Sm. Pkg. Min. Marshmallows, Bag Walnuts, Can of Cream Topping
Beverage: Coffee, Tea

Appendix B

1. A Geological Review
Prepared by Wheatridge
High School

Deposition of Formations

This region known as the Uinta geosyncline was a large basin which slowly filled with sediment. As it filled it slowly sank. The area was below sea level and many marine fossils were preserved in the rock. The area was forced up and then it would sink again. Evidence shows that this happened at least twelve times. The deeper rocks shown metamorphism due to the great pressure of the overlying rocks.

Uplift and Mountain Building

The second step in the construction of the landscape is the period of diastrophism or deformation of the rock formations which follows the filling and overloading of a geosyncline. The main structural features of the region consists of the eastern and of the Uinta Mountain Uplift, together with a number of smaller synclinal and anticlinal folds along the mountain slopes. Folding and elevation of those ranges began near the close of the Cretaceous Period, some 70 million years ago. The initial uplift is called the Laramide Revolution and was responsible for the formation of all the Rocky Mountains. Two good folds in the strata are seen at Mitton Park Fault and at the entrance of Split Mountain Canyon.

Faulting

Faulting was the third phase in the development of Dinosaur National Monument. Both flanks of the Uinta Range are greatly faulted. Faults are numerous throughout the Monument. Some of the best examples are the Mitton Park and Island Park faults.

A Geological Review Cont'd

The greatest displacement (movement) is approximately 4000 feet below Tanks Peak along the Yampa Canyon. This faulting began about 20 million years ago and has continued up to about 1 million years ago.

Erosion

Erosion the fourth major event. The action of streams, waves, wind ice and other erosive agents relentlesely chisel away at the earth's surface. Todays physical features in the Monument are a combination of the building up and the tearing down of the land. This endless conflict, between the uplift and erosion has formed the very scenic landscape.

2. Dinosaur's Prehistory
Prepared by Wheatridge
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The prehistoric peoples who lived in and adjacent to the canyons of the Green and Yampa rivers and their tributaries in Dinosaur National Monument belonged to the Fremont Culture, an outgrowth of the Basketmaker (Anasazi) that occupied the region from about 400 to 800 A. D. and possibly longer. They practiced hunting, fishing and agriculture. There is evidence that these Indians were descendants of earlier nomadic tribes that survived chiefly by hunting, and later settled along stream bottoms in sheltered areas where they took up farming. These early inhabitants may well represent extensions and modifications of the Desert, Basketmaker, and early Pueblo cultures of the Great Basin, American Southwest, and Utah

The presence of early Fremont residents and farmers in the region is documented by well preserved artifacts, a few skeletal remains, petrographs (drawings on rock surfaces), dwellings, and burial sites. These Indians were already practicing irrigation in the early part of the Christian era, if not by means

of ditches, at least by diversion of floodwaters to their farms, many hundreds of years before the Mormon pioneers became the first Anglo Saxons to divert water from streams for growing crops. The cultivation of corn and squash and later of beans by these early inhabitants marked the beginning of a sedentary life and the waning of an earlier nomadic existance. It is believed that at the Castle Park site on the Yampa River, 10 miles upstream from Echo Park, corn was grown as early as 400 A. D.

On a basis of the findings at Castle Park, archeologists concluded that this culture showed "virtual identity" with the Fremont Culture in east-central Utah. According to archeologists the Fremont is a "laggard culture, basically Basketmaker in content, that survived without marked change into early Pueblo times." However, in such an isolated area as the Yampa Canyon, primitive customs may have, and no doubt were, continued much longer than in more populated and progressive areas. This is shown by an extension of the practice of the older customs of hunting, fishing, and gathering of wild plants for food.

Cliff murals and other prehistoric Indian drawings (painted pictographs or pecked petroglyphs) are common in places along walls of Weber, Navajo, and Frontier sandstones at various places in the Monument, particularly in Castle park, McKee Spring near Rainbow park on the Island Park Road, Split Mountain Canyon, Jones Hold and other areas.

3. Early Exploration

The first recorded exploration of the canyons of the Diosaur area is by William H. Ashly, a fur trapper who traversed Flaming Gorge and Red Canyon in buffalo skin boats in 1825. Ashly left an inscription on a rock at a particularly severe rapid later to be named Ashly Falls by Powell in 1869. This rapid is now covered by Flaming Gorge reservoir.

Although documentation is weak, it appears that a trapper named Meek and several companions traversed Lodore and Whirlpool canyons one winter on the ice. This would have taken place sometime around 1840.

The Browns Park area has a history of harboring rustlers and outlaws in the last century. Butch Cassidy and his wild bunch used Brown's Park as a hideout and used the Phantom trail to the east of Lodore as a rustled cattle trail. Trappers also abounded in the Flaming Gorge, Red Canyon, and Brown's Park area.

Probably the most famous explorer of the area is Major John Wesley Powell who made expeditions down the Green and Colorado Rivers in 1869 out 1872. He was responsible for naming many places throughout the canyons such as: Lodore, Disaster Falls, Hells Half Mile, Whirlpool Canyon and Winners Grotto. His account of the trips are complied in his book The Exploration of the Colorado and It's Canyons. Another account called A Canyon Voyage, written by a young man named Fredrick Dallenbaugh is a different view of the 1872 expedition. Powells expeditions are probably the main factors which opened the canyons to the world.

4. Modern Developments

In 1909 Earl Douglas discovered a large number of petrified Dinosaur Bones near Jensen, Utah and conducted a major dig for the Carnegie Museum. On October 4, 1915 this dig site was proclaimed as Dinosaur National Monument. In July of 1938 the boundries of the Monument were expanded to approximately what they are today. The area is now supervised by the National Park Service.

Recreational river running in the area started in the late 1920's when the Hatch family of Vernal Utah began taking people through the canyons in wooden

boats. The 1950's brought on surplus neoprene boats and river running began to grow. It is now at the point where more than 10,000 people went through the canyon in 1971.. Consequently, the National Park Service has established a limit to the number of persons allowed through the canyon and has built camp sites for river runner's use. This insures that the canyon shall remain pretty much the way it is.

The Yampa River is one of the few free flowing rivers (ie. it has no dams) in the west. Consequently, it has a heavy run off in the Spring and drops to a trickle in the Fall. Several towns upstream of the Monument dump their raw sewage into the Yampa, making it unfit to drink.

Flaming Gorge dam, built and controlled by the Bureau of Reclamation on the Green River was completed in 1964 and its reservior has flooded the Flaming Gorge and much of Red Canyon. The Green River is now controlled and little water is let out in the Spring. So, the reservoir level rises in the Spring and water is let out in the Summer and Fall when the Yampa subsides. This makes for good river running in the area from late April through September.

5. Dinosaur National Monument
River Mileages & Elevations

Yampa River	Mileage	Cumulative Mileage	Ele.
Deerlodge Park	0.0	0.0	5590
Anderson Hole	3.9	3.9	
Teepee Hole	5.5	9.4	
Harding Hole	16.1	25.5	
Castle Park	8.1	33.6	
Warm Springs	7.4	41.0	
Echo Park	2.0	44.6	5063

River Mileages & Elevations

Average descent 12 ft. per mile.
Least descent at Deerlodge, 1 ft. per mile.
Greatest descent is at Teepee Rapids, 31 ft. per mile

Continuing on Green River from Echo Park.			5063
Jones Hole	6.2	50.8	
Island Park	9.2	60.0	
Split Mountain	10.8	70.8	4783

Average descent, 8 ft. per mile.
Least descent is around point of Steamboat Rock, 3 ft. per mile.
Greatest descent is Moonshine Rapids, 39 ft. per mile.

Green River

Lodore	0.0	0.0	5336
Lower Wade & Curtis	2.1	2.1	
Pot Creek	5.4	7.5	
Triplet Falls	2.1	9.6	
Rippling Brook	2.6	12.2	
Echo Park	5.4	17.6	5063
Jones Hole	6.2	23.8	
Island Park	9.2	33.0	
Split Mountain	10.8	43.8	4783

Average descent 13 feet per mile
Between Lodore - Echo Park least descent is at Lodore & above upper Disaster Falls, one foot per mile.
Greatest descent is in Hells Half Mile which is a drop of 30 feet in less than 1/2 mile.

Prepared by National Park Service, Dinosaur National Monument. 1/72

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